IRRIGATION DEVELOPMENT IN A

'THE ECONOMIC IMPACT'

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ALBERTA IRRIGATION PROJECTS ASSOCIATION

ALBERTA IRRIGATION PROJECTS ASSOCIATION

INCORPORATED

April 24, 1984

Office of the Premier
307 Legislative Building
109th Street and 9th Avenue
Edmonton, Alberta
T5K 2B6

Attention: Hon. Peter Lougheed

Dear Mr. Lougheed:

RE: THE ECONOMIC IMPACT OF IRRIGATION IN ALBERTA

We commend the Government of Alberta for its foresight in development of water policies and particularly, for its investment in irrigation.

The Alberta Irrigation Projects Association felt it was an opportune time to commission a study to reaffirm the value of investments in irrigation. The enclosed report examines the impact of irrigation on the region, the province and the country.

The report illustrates that the Province of Alberta receives a substantial return on its irrigation investment through taxes alone. For a further five-year $385 million investment in irrigation development, the province would receive $1.4 billion over the life of the project. In addition, the positive impact of this investment would be 15 percent to the primary users, 66 percent to the rest of Alberta and 19 percent to the rest of Canada.

Nonquantified benefits are significant in the region, as well, and are listed in the report. More important of these are; water based recreation, a major subindustry in Southern Alberta; low risk of drought-induced crop loss; and excellent harvest conditions in the region ensuring prime crop grades for export.

Local civic leaders have long recognized that incomes in the south have generally been lower than average but have not followed the traditional boom and bust cycles of the rest of the province. This can be largely attributed to the wide stabilizing influence that the irrigation industry has on the region.

In view of the above and other information found in the report, the Alberta Irrigation Projects Association recommends that the province continue its current water development programs and the current cost-sharing formula be maintained.

Yours respectfully,

F. J. Brewin, President
Alberta Irrigation Projects Association

IRRIGATION DEVELOPMENT IN ALBERTA

'THE ECONOMIC IMPACT'

EXECUTIVE SUMMARY

for

ALBERTA IRRIGATION PROJECTS ASSOCIATION

by

UNDERWOOD McLELLAN LTD.

the uma group

ABSTRACT

This report on the economic impact of irrigated agriculture in Alberta was requested by the Alberta Irrigation Projects Association (AIPA), who felt it was an opportune time to reaffirm the value of irrigation investments to the Province of Alberta. This involved identifying the benefits from irrigation, the nature of these benefits, and how these benefits are distributed between water users and others.

The technical study concludes that benefits from irrigation activity extend far beyond the water users. For example, if the current projected annual government investment rate of $77 million through the Irrigation Capital Works (I.C.W.) and Headworks programs continues for the next five years, the province can expect that the total government revenues that will be generated by this work will be about $1,438 million for a present value of $740 million.

Irrigation activities are responsible for the employment of some 35 thousand people in Alberta, directly or indirectly. In addition, these activities account for $941 million of provincial gross domestic product annually. The distribution of expected annual benefits arising from the current investments in regard to reclaimed land, increased irrigated acres and construction activities, etc., is 15 percent for water users, 66 percent for the province and 19 percent for other Canadian provinces.

Irrigation is a vital component of the socioeconomic environment in Southern Alberta. Many of these interrelationships were not quantified for this analysis, but should be considered when evaluating the impact of irrigation activities within the province. Nonmeasured benefits include: potable water supplies to communities and industries, reservoirs for recreation, greater crop flexibilities and agriculture production in an area with reliable harvest weather.

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1. INTRODUCTION

OBJECTIVES OF STUDY

The Alberta Irrigation Projects Association (AIPA) requested a study to determine the impacts of irrigation development on the Alberta economy. This study addresses the following questions: who benefits from irrigation, what impacts it has on the provincial and national economies, and how these impacts are distributed among the various beneficiaries.

The report briefly reviews the methodology for assessing the impacts. The history and present status of the irrigation industry in Alberta is briefly described. A discussion follows on the effect of irrigation development on the gross domestic product, government revenues, and employment. Both the Alberta and Canadian economies are included in the measurement of impact upon gross domestic product and government revenues.

Economic effects of continued rehabilitation expenditures for another 5-year period are examined. Additional nonquantified benefits arising from irrigation activities are also listed.

INPUT-OUTPUT ANALYSIS

Because of the complex nature of the economy, the total secondary impacts from irrigation development are measured using a systematic procedure such as input-output analysis. This technique has been used throughout the study to measure the secondary impacts of irrigation development on the Alberta economy. Input-output analysis uses a mathematical solution procedure to simultaneously balance all of the transactions that occur within an economy as a result of a direct change in the activity of one or several sectors in the economy. The input-output analysis then resolves the amounts of interindustry purchases and sales required to bring about such a change.

The most recent input-output model available for the Alberta economy is based on 1974 interindustry transactions. Economic data for 1981 was available at the commencement of this analysis for most sectors of the economy and the 1974 model was updated to 1981 industry sales levels.

The analysis consists of two major components. The first component is designed to measure the contribution of the current irrigation industry and its related activities within the Alberta Economy. The contribution was estimated by measuring the economic activity levels of the Alberta economy in 1981 and comparing this to simulated economic activity levels within the province without an irrigation industry.

The second component of the analysis was designed to measure the benefits to various sectors of society from a continuation of present rehabilitation and expansion expenditures. This component also utilizes the comparison of two scenarios. The first scenario assumes that there will be continued rehabilitation expenditures for another 5-year period. Irrigation will increase, and the economy will benefit from this increased production, as well as from the extra funds spent on construction-related projects. The second scenario assumes that there is no provincial funding. Irrigation remains unchanged; however, water users are assumed to make the expenditures that would be necessary to sustain irrigation supply facilities at the present level. The net effects of these two scenarios indicates the benefits arising from a continuation of the rehabilitation program.

HISTORY OF IRRIGATION IN SOUTHERN ALBERTA

Large portions of the southern and eastern regions of Alberta's fertile areas suffer from a lack of rainfall. Through irrigation, crop production has been increased and the hazards of drought and crop failure have been reduced.

The first settlers in the area diverted water from small streams, and in the following years numerous small projects were developed throughout Southern Alberta. During the period of major railway construction, land grants were made to the railways, which subsequently developed irrigation projects to increase the value of these lands for sale to settlers.

After 1915, farmer-owned-and-operated projects in irrigation districts were established under the supervision and authority of the provincial government. Following World War II, the provincial and federal governments accepted responsibility for the construction of new irrigation projects and the expansion and maintenance of existing projects.

During the past century, over one million acres of irrigable land have been developed in Southern Alberta, and the potential exists to substantially increase this acreage. The original concept that irrigation projects would be paid for out of the production from farms proved to be inadequate. The irrigation systems were too costly to be operated and maintained by water users and consequently were in a state of deterioration in the late 1960's when the provincial government defined its role in the rehabilitation and expansion of the systems.

A series of studies on the economic impact of irrigation development in Alberta was undertaken by provincial and federal agencies during the 1960's, culminating in 1966. These studies concluded that water users received 11 percent of all benefits derived from irrigation activities and that the other 89 percent of benefits were shared by the local community, the province, and Canada as a whole. These percentages were based on the relative shares of gross domestic product arising from irrigation. Based on the relative benefits of irrigation, a cost-sharing formula for irrigation rehabilitation and development was negotiated. This formula allocated contributions of 86 percent to the provincial government and 14 percent to the water users.

PRESENT STATUS OF IRRIGATION INDUSTRY

Over 30 crops are currently being raised on Southern Alberta's one million plus acres of irrigated land. About one-half of these acres are grains and oil seeds with one-quarter planted to hay and tame pasture. Potatoes, sugar beets and other specialty crops account for the remaining acres. There is an extensive livestock industry in the south with 60 percent of Alberta's feeder cattle located on irrigation farms.

The irrigation industry has undergone substantial changes in the past two decades. The province has invested approximately $104 million in the Headworks Improvement program, and $146 million in the Irrigation Capital Works (I.C.W.) program between 1970 and 1982. Water users have invested, through the irrigation districts, $24 million in I.C.W. and $55 million in operating and maintenance programs during that same period.

Water users have also funded all on-farm costs related to the above development activities. This investment includes purchase of sprinkler systems, land leveling for gravity irrigation systems, subsurface drainage and other facilities. Sprinkler system purchases alone have totalled over $200 million between 1970 and 1982. Of the 770,000 acres of irrigable land in 1970, an estimated 30 percent was irrigated with sprinkler systems. By 1982, irrigable land had increased to a little over one million acres and the percentage being sprinkled had increased to 74 percent.

This has resulted in a water demand equal to or greater than the capabilities of the existing water storage and supply facilities. The water demand is also nearing the limit of available water supply in the basins. Further increases in irrigated acreage can take place only if facilities and capabilities are developed both to capture more of the natural runoff and to better control the losses which occur within the supply, distribution and application systems.

Initial investments in the Headworks and I.C.W. programs were aimed at replacement of works that had deteriorated almost to the point of being unusable. As events such as the advent of sophisticated sprinkler equipment and realization of the limitation of water supplies were unfolding, and as districts were getting ahead of the worst deficiencies, the emphasis gradually changed from emergency improvement and replacement to anticipation of the necessary characteristics of future irrigation systems.

A mixture of on-farm water application methods will always be used, but the sprinkler and other closed pipe systems that have developed mean that there is a new set of parameters for the water distribution systems. Under gravity irrigation methods, water has to be delivered to the highest elevation of land possible on a given parcel, and only the land that is below this point is considered irrigable. To serve a sprinkler pump, the precise elevation is not important and the delivery point can be a compromise between convenience for the distribution system and that of the individual land parcel. Further, a sprinkler system uses a precise flow of water, but only when it is operating. In the past, the gravity systems were not so demanding. This, coupled with an ever-increasing need to conserve water, places a significantly greater requirement for water control in the distribution system.

Pipelines, modern control technology, balancing reservoirs located throughout the system and many other design features are being utilized to adequately respond to these and other expected needs.

2. THE IMPACT OF IRRIGATION IN 1981

BENEFITS OF IRRIGATION DEVELOPMENT

It is stated in the Canada Water Yearbook that irrigation development requires long lead times for planning, design and construction. Because of this long time lag between commitment and construction, investments may have to be made a generation before benefits are realized[1]. This is not the case in respect to the economic stimulus of the construction activity in the type of under-employed economy that Alberta is experiencing today. These benefits are immediate and substantial.

The provincial economy is highly complex and the indirect effects of an economic activity such as planning and construction are more far-reaching than the direct impacts may indicate. Purchases by one industry or by government result in increased sales by another industry which, in turn, lead to a chain of interindustry purchases and sales. Increased household incomes that also result from the increased economic activity boost the economy as well.

The effects of interindustry and household commerce are referred to as secondary impacts, and the positive effects they produce are substantial. In the present under-employed economy, Alberta has abundant resources capable of assisting in irrigation development. These resources, in the form of workers and equipment, are moving into the irrigation region as alternative employment opportunities become depleted.

In the present economic environment, the development phase of irrigation is not a direct cost to society. In fact, when the benefits arising from the development phase are considered, the benefits of irrigation development are realized in less than the suggested "one-generation" time lag.

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[1] Canada Water Yearbook 1981-1982 "Water and the Economy", Environment Canada.

IMPACT ON PROVINCIAL AND CANADIAN ECONOMY

Impact on Gross Domestic Product:

Gross domestic product is a measure of income to the basic resources (land, labor and capital) of an economy and is used as a base measurement of economic activity levels.

The provincial gross domestic product with the current (1981) irrigation development was estimated by the input-output model to be $47,191 million, and the gross domestic product in a similar economy less the irrigation activities was estimated at $46,250 million for a loss of 2 percent of gross domestic product.[2] (Table 1) Although from these numbers the irrigation sector may not appear to be a major contributor to the total economic activity within the province, it is a profitable public investment, and a source of livelihood to many Albertans. For example, gross domestic product arising from irrigation is estimated to be $940 million annually. This translates to $244 annually for every resident of Alberta.

The input-output analysis conducted for this study included only the Alberta economy. Sixty-four percent of Alberta's imports come from other provinces in Canada, and consequently the irrigation activities within the province result in a positive impact on the Canadian economy. Assuming a value-added multiplier of 1.21, the additional gross domestic product accruing to the rest of Canada is $292 million. This is underestimated because the multiplier does not account for second-round effects upon the imports between other provinces.

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[2]The input-output model was balanced according to economic parameters for 1981 which were available in January 1984 from the Alberta Bureau of Statistics. Many of these parameters were preliminary estimates and are being updated by the bureau.

TABLE 1

ANNUAL IMPACT OF IRRIGATION ACTIVITIES

Effect Upon	With Irrigation ($ million)	Without Irrigation ($ million)	Change ($ million)
	GROSS DOMESTIC PRODUCT OF ALBERTA		
Water users	234	0	234
Alberta economy (excluding irrigation producers)	46,957	46,250	707
Canadian economy (excluding Alberta production)	9,901	9,609	292
TOTAL	57,092	55,860	1,232
	ANCILLARY BENEFITS		
Provincial Employment (no. of workers)	1,032,366	997,261	35,105
Provincial revenue ($ million)	13,905	13,742	163
Federal revenue ($ million)	7,146	7,001	145

Impact on Government Revenue:

As economic activities increase within the province, government revenues also increase and, consequently, an investment by the provincial government to encourage economic growth will result in increased government revenues.

Provincial revenues, including local government revenues, were $13,905 million in 1981; federal revenues were $7,146 million. Econometric models were used to estimate a decrease in revenues to $13,742 and $7,001 million respectively. Thus, total government revenues would have decreased by $307 million without irrigation. Annual provincial government revenues within the province attributable to irrigation activities are $163 million. This is compared to annual government contributions in 1981 of an estimated $36 million to irrigation rehabilitation activities (I.C.W. and Headworks funding).

Impact on Employment:

In 1981, approximately 1 million people, excluding public administration personnel, were employed within the Province of Alberta.

Employment in all sectors of the economy is stimulated by irrigation. In the simulated economy, without irrigation, the sectors particularly affected are vegetable processing (100 percent loss), dams and irrigation construction (96 percent loss), agriculture (21 percent loss), feed manufacturing (19 percent loss) and the miscellaneous food industry (14 percent loss). The remaining sectors had employment decreases less than 5 percent.

In a nonirrigated type of agriculture, typical of the nonirrigated parts of the southern region, total employment would have been 96 percent of the 1981 agricultural total. Virtually all sectors of the provincial economy would have been affected to some extent.

IMPACT ON REGIONAL ECONOMY

The impact of irrigation on the provincial economy is not a large proportion of the total activity since irrigation is largely confined to the southern region. In this region, however, the proportional impact of irrigation is very significant.

The organized irrigation districts are contained within Census Divisions (C.D.) 1, 2, 3, 5, 6, and 9. Table 2 shows the relative size of the irrigation zone economy to the total provincial economy.

TABLE 2

INCOME AND POPULATIONS FOR SOUTHERN ALBERTA

Region	Total Income ($ million)	Total Population[1]	Avg. Income Per Person ($)
Irrigation Zone[2]	13,139	930,238	14,124
Irrigation Zone excluding Calgary	3,914	337,490	11,597
Calgary[3]	9,225	592,743	15,563
Lethbridge[3]	766	54,072	14,166
Medicine Hat[3]	539	40,380	13,348
Province	29,070	2,237,925	12,991

SOURCE: Alberta Statistical Review, Annual 1982 and Alberta Economic Accounts, 1982; Alberta Bureau of Statistics.

[1] 1981 Census.

[2] Composed of all census divisions in which organized irrigation districts exist (C.D. 1, 2, 3, 5, 6, 9) (includes cities).

[3] City incomes are proportioned by 1981 Census Division income and 1980 Income Tax Returns by city. This proportion may be biased by a regional propensity to file tax returns.

The average income per person for Alberta is $12,991 compared to an average income per person for the irrigation region (excluding Calgary) of $11,597, or 89 percent of the provincial average. Thus, since incomes in the irrigation region are lower than in the province generally, investment in irrigation projects in the Southern Alberta region is not an investment in a region that is already booming.

The irrigation zone (excluding Calgary) accounts for 13 percent of total provincial personal income. Irrigation accounts for 2 percent of the provincial gross domestic product generated in Alberta. If 80 percent of this amount remains in the southern region and if personal income is used to proportion the regional gross domestic products, then 12 percent of all gross domestic product in the southern region can be attributed to irrigation activities. This is a significant impact on Southern Alberta.

3. ECONOMIC IMPACTS OF CONTINUED REHABILITATION EXPENDITURES

DIRECT EFFECT OF CONTINUED REHABILITATION ON IRRIGATION AGRICULTURE

The continuation of the present capital works rehabilitation programs will have direct impacts on the farmers and on the irrigation districts that serve those farmers. These impacts have been grouped into three categories: (1) Irrigable acres
(2) Yield
(3) District costs

Improvements in the water storage and delivery systems will allow more acres to be irrigated because of better access to the water supply and improved efficiencies in handling the water.

Yield increases from existing irrigated acres can be anticipated with a rehabilitated delivery system. In addition, yield is used in this study as a surrogate for any effect that can be construed as a return to management. This impact includes the gains from rehabilitation in terms of better farm management, easier irrigation, more leisure time, and more time for other farming activities as well as the actual crop yield increases resulting from the potential of more precise irrigation scheduling.

Reconstruction of a particular lateral or system eliminates the need for extensive maintenance activities that accompany works which are nearing the end of their useful life. This has been identified as a savings to the district. Without rehabilitation, an added maintenance cost is incurred either in actual dollars spent, or in further deterioration of the delivery system if the maintenance is not undertaken.

The ranges of estimates for the direct impacts are shown in Table 3. The ranges signify uncertainty in projecting into the future, as well as a variation in the assumptions that establish the levels of impact.

TABLE 3

DIRECT BENEFITS ANTICIPATED FROM THE REHABILITATION PROGRAM 1985 THROUGH 1989

	Lower Levels	Expected[1] Levels	Upper Levels
Increase in irrigable acres (no. of acres)	133,000	133,000	175,000
Increase in yields (%)	1.0	5.4	6.0
District cost savings ($ million per year)	1.0	2.2	3.0

To achieve these direct benefits, government sponsored programs will have invested over the five year period about $240 million in the headworks and about $148 million in the I.C.W. program. The farmers' portion of the I.C.W. program will amount to about $24 million.

SECONDARY IMPACTS

The expected annual impacts for 1990 (1981 dollars) of the changes resulting from the current projections of five years of rehabilitation expenditures have been estimated for all three levels of change. The results for the "expected level" are shown in Table 4.

TABLE 4

IMPACT OF CONTINUED REHABILITATION EXPENDITURES
(Expected Level)

Effect Upon	Impact Due To: Production Change	Impact Due To: Construction	Total
	ECONOMIC BENEFITS		
Water users ($ million)	61.3	0.6	61.9
Alberta economy (excluding irrigation producers) ($ million)	145.1	129.4	274.5
Canadian economy (excluding Alberta) ($ million)	40.9	38.0	78.9
TOTAL ($ million)	247.3	168.0	415.3
	ANCILLARY BENEFITS		
Employment (no. of workers)	1,822	2,906	4,728
Provincial revenue ($ million)	24.7	22.6	47.3
Federal revenue ($ million)	23.6	19.7	43.3

Benefits to producers are estimated to be $62 million per year, compared to $275 million for other sectors of the Alberta economy, and $79 million for the rest of Canada.

The distribution of annual benefits in 1990 under the level of change resulting from the next five years of rehabilitation expenditures, the ratio of benefits to water users vs. others, is 15:85. However, if we assume the "lower level" of results as shown in Table 3, the share of the total benefits accruing to water users reduces to 13 percent.

TABLE 5

DISTRIBUTION OF BENEFITS TO SOCIETY OF CONTINUED REHABILITATION EXPENDITURES

Beneficiary	Annual Benefits Under		
	Lower Level	Expected Level	Upper Levels
Irrigation Producers (%)	13	15	15
Other Alberta Economy (%)	67	66	66
Rest of Canada (%)	20	19	19
TOTAL	100	100	100

IMPACT UPON GOVERNMENT REVENUES

Government costs and revenues are important criteria for public assistance. What would be the return to Alberta Treasury as a result of this 5-year rehabilitation program at the currently projected level of $77 million annually? As shown in Table 4, provincial revenue would increase by $22.6 million per year for five years because of increased construction activity, and by $24.7 million per year due to increased irrigable land for total revenues of $1,348 million over a 50-year productive life of the irrigation development. The present worth of this future stream of revenues is $739 million, about 97 percent more than that spent during the 5-year period.

4. NONQUANTIFIED COSTS AND BENEFITS

Many benefits resulting from irrigation projects cannot be quantified and will be jeopardized if government funding of maintenance and rehabilitation programs is not continued. Some of these benefits are as follows:

- Potable water supply to about 48 communities with a population of about 21,000 people

- Potable water supply to 14 industrial users

- Reservoirs for recreation, boating, swimming, water skiing, fishing

  . There are 50 developed recreation facilities operating on irrigation reservoirs.

- Existence of many commercial and service industries as a direct result of irrigation

- Greater crop flexibility

- Much higher level of cropping alternatives

  . The industry could rather quickly switch to other crop mixes in response to marketplace or political incentives.

- Lower risk of drought-induced crop loss

  . Since irrigation farmers have generally higher operating costs than dryland farmers, they carry a somewhat higher risk due to other risk elements such as insect and disease infestations; on the other hand, because of their crop choice flexibility, marketplace risk is probably lower. In Southern Alberta,

avoidance of drought risk is overwhelmingly more valuable than of all other risk elements.

- High likelihood of a consistent return on investment in irrigation

  . The mild climate of Southern Alberta, which results in more heat units and frost-free days than in the agricultural zones north of Calgary, gives a high likelihood of good harvests of quality crops which can compete successfully on international markets. Consumers prefer a consistent quantity and quality product from their suppliers.

- Lower soil erosion than dryland farms

- Taking advantage of natural slopes for pipelines to provide water under pressure to some water users

- Better, neater, more attractive farmsteads, usually with large vegetable and fruit gardens

  . These provide a regional buffer against unplanned loss of outside sources of food.

- Larger towns, with many more amenities than can be provided by dryland farming communities

  . The larger population results in better medical care, better education facilities, more community services, etc.

- Lower district operating costs because of lower turnover of experienced staff

  . I.C.W. funding provides work for irrigation district staff during the off-season.

- Maintenance of effective irrigation systems

  . Many farmers who have invested heavily in irrigation equipment would have to revert to dryland agriculture, if it becomes more difficult to deliver an adequate amount of water.

The following are also dependent upon continuation of the I.C.W. program:

- Many farmers, whose laterals have not yet been rehabilitated, have contributed their share of the districts' 14 percent of costs of the I.C.W. program for up to 15 years. In fairness to them, the I.C.W. program should be continued.

- Until all lands with low production, as a result of canal seepage have been returned to full production, some protection from large damage claims against the irrigation districts will have to be continued.

- Efficient water use is directly proportional to the money spent on the I.C.W. program. The rehabilitation program can be seen as the means to higher efficiencies and increased irrigated acreages, or other uses from the available water supply. Investment in irrigation can push the limits of the water delivery capacity closer to the limits of the water supply, improve the efficiency of the irrigated acreage, or both.

5. CONCLUSIONS

Irrigation activities within the Province of Alberta in 1981 increased the provincial gross domestic product by $941 million or 2 percent of the provincial total gross domestic product. The quantified economic benefits (gross domestic product) from irrigation are estimated to be distributed as follows: $234 million, water users; $707 million, the rest of the province; and $292 million, the rest of Canada. The impact on the rest of Canada is underestimated because of the nature of multiplier analysis used. If irrigation activities ceased, economic activity in the southern region would be reduced by 12 percent.

The impact on employment in Alberta closely parallels the impact on economic activity, with 4 percent of Alberta's total employment attributed directly or indirectly to irrigation.

Revenues to local and provincial governments in 1981, arising from irrigation activities, are estimated to be $163 million. Federal revenues resulting from increased economic activities resulting from irrigation within the Province of Alberta is estimated at $145 million.

Future rehabilitation and expansion in irrigation will produce substantial positive effects in the present under-employed economy. In addition, nonquantified benefits of irrigation such as community services, water supplies and water recreation are an integral component of the socioeconomic development of Southern Alberta.

Past rehabilitation programs have been funded jointly by water users and the provincial government. This arrangement was based upon the premise that benefits of irrigation development are not confined to water users only. Our analysis suggests that if rehabilitation were to continue in the future, the benefit of the rehabilitation activity would be distributed as follows: 15 percent, water users; 66 percent, the rest of the province; and 19 percent, the rest of Canada.

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April 24, 1984

Alberta Irrigation Projects Association
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T0K 0V0

Attention: Mr. F. J. Brewin
Chairman

Dear Sir:

RE: THE ECONOMIC IMPACT OF IRRIGATION IN ALBERTA

We take pleasure in submitting to you the attached Executive Summary of our report on the economic impact of irrigation in Alberta. The detailed report will follow shortly.

We have greatly appreciated the high level of cooperation provided by your association, particularly the committee which was set up to oversee the study and coordinate the securing of data from the districts.

We also appreciate your direction and participation in the March workshops.

It has been an assignment which we have greatly enjoyed and feel that it fairly expresses the value to both Alberta and the rest of Canada of investment in irrigation systems improvements. Those primarily responsible for the report are:

Dale Russell, Ph.D., P.Ag., Project Leader
Surrendra Kulshreshtha, Ph.D.
Gordon Ayers, M.Sc., P.Eng.
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Alberta Irrigation Projects Association
Attention: Mr. F. J. Brewin
Chairman

April 24, 1984

We are, of course, available to discuss this summary and the detailed report at your convenience.

Cordially yours,

UNDERWOOD McLELLAN LTD.

K. R. Craig

Kenneth R. Craig, P.Eng.
Head, Irrigation Division
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the Unda group